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ENVIRONMENTAL DECOMMISSIONING OF A MANUFACTURING PLANT

by

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This paper describes the environmental decommissioning of an old manufacturing plant and illustrates the multi-facetted, multi-discipline nature of this type of project.

The purpose of the decommissioning was to identify and remediate any significant environmental contamination on the property caused by manufacturing operations, which would be a concern if the site was redeveloped for light commercial and residential uses.

The owner of the property was moving the manufacturing operation to a more modern building on another property which would allow the manufacturing process to be more efficient. The owner wanted to sell the property to a responsible developer and wanted to work with the him to ensure that the redevelopment did not create any environmental liabilities for either party.

The site was originally developed in the 1830s for saw mills, flour mills and warehouses. More recent industrial use of the property included an iron foundry, a brass and bronze foundry, metal plating, spray painting and machining.

A number of environmental regulations and guidelines were considered during this decommissioning. Four of the more important ones are listed below:

a) Guidelines for the Decommissioning and Cleanup of Sites in Ontario, February 1989.

b) Ontario Regulation 309 (Environmental Protection Act), June 1985.

c) Ontario Regulation 11/82 (Environmental Protection Act), January 1982.

d) Ontario Regulation 654/85 (Occupational Health and Safety Act), 1985

The Decommissioning Guidelines provide limits for total concentrations of metals and other contaminants in soils for either commercial/industrial or residential/parkland redevelopment.

Regulation 309 provides criteria for leachable concentrations of various contaminants and classifies materials as hazardous wastes, registerable wastes or non-registerable material. Hazardous wastes and registerable wastes must be registered with the MOE, manifested for transport and must be disposed of at an appropriately approved waste disposal facility.

Regulation 11/82 classifies material with over 50 ppm PCB as "PCB wastes". This regulation and several handbooks available from the MOE and Environment Canada provide information on the proper handling and storage of PCB wastes.

Ontario Regulation 654/85 of the Occupational Health and Safety Act requires that friable asbestos be removed from buildings prior to demolition and provides direction on the correct removal methods.

The overall structure of this decommissioning project involved the following steps:

a) environmental investigations to determine the nature and extent of any contaminant problems;

b) review of the environmental report and consultations with the property owner, the property buyer, the MOE and various advisers such as lawyers, real estate agents and architects;

c) development of a decommissioning plan;

d) review of the decommissioning plan by the MOE and other interested parties;

e) implementation of the decommissioning plan and remedial measures;

f) final report preparation and MOE review; and

g) MOE approval of the redevelopment.

The tasks which were completed as part of the environmental investigations to identify and assess contaminant problems on the property are listed below:

a) initial investigations

b) surface soil sampling

c) geophysical survey

d) drilling and subsurface soil sampling

e) ground water testing

f) building material testing

g) asbestos inventory

h) PCB inventory

i) miscellaneous chemicals inventory

The initial investigations involved interviews of long-term employees and review of the plant processes and history. Review of available site plans, reports and maps as well as stereoscopic interpretation of historical aerial photographs was also carried out.

The purpose of these initial investigations was to identify areas of concern which warranted more detailed sampling and analysis.

The next task was to collect composite samples of the surface soils in the identified areas of concern. The approach used on this project was to sample areas of stained or discolored soil in areas where chemicals or wastes were routinely handled. An alternative approach would be to collect composite soil samples on a grid basis across the entire site. The surface soil samples were tested for the parameters listed in the Decommissioning Guidelines. Many of the samples exceeded one or more of the soil clean-up criteria including some of the background soil samples collected in urban areas far removed from the site. The collection of background samples is, of course, an integral part of any soil sampling survey.

A geophysical survey was carried out to map terrain conductivity anomalies on the property including any buried drums, metallic objects or conductive buried wastes.

A Geonics EM31 Terrain Conductivity Meter was used. This instrument consists of a transmitter coil, to produce an electromagnetic field and a receiver coil to measure the resultant electromagnetic field created in the ground. The electromagnetic field responds to variations in subsurface conductivity created by soil quality, soil texture, ground water quality and the presence of buried materials. The instrument has a fixed coil spacing that senses conductivity variations to a depth of about 5 m.

The survey was conducted along lines spaced about 2.5 m apart. Readings were taken at about every 0.8 m along these lines. the survey was not completed in areas where surficial noise (vehicles, buildings, rail lines, metal fences, power lines, above-ground drums, and other metallic objects) prevented the collection of quality data. Approximately 3000 data points were collected on the site in the space of two days using a computerized data logger.

The geophysical results were plotted as colour contours of terrain conductivity. Conductivity values representing background values typical of "clean" soils are shaded blue and green. Anomalously conductive terrain is represented by shades of yellow, red and purple. These elevated conductivity values may be caused by clay rich soils, buried waste and metallic materials, contaminated ground water and surficial noise. Selected high conductivity anomalies were targeted for further investigation in the drilling program.

A drilling and subsurface soil sampling program was carried out to further define the areas and depths of soil contamination. Chemical analysis of the soil samples indicated widespread exceedance of the Decommissioning Guidelines for copper, zinc and several other parameters related to phytotoxicology and agricultural considerations. A few samples also exceeded the Decommissioning Guidelines for cadmium, lead and mercury which are based on human health considerations.

Additional testing for Regulation 309 Leachate Quality Criteria was also carried out on selected soil samples. None of these samples exceeded the Regulation 309 Criteria by a factor of 100 or more, therefore, none of the soils were classified as hazardous wastes.

Ground water monitors were installed in a number of the boreholes. Ground water levels were measured and permeability testing was carried out to determine ground water flow directions and rates. Ground water samples were collected and submitted for chemical analysis. None of the Ontario Drinking Water Objectives related to health (MAC) were exceeded although several of the objectives related to aesthetic considerations (MDC) were exceeded. Since the plant and surrounding area are

serviced with piped municipal water, this minor ground water quality degradation was not a major consideration in the decommissioning.

The building materials in the plant including floors, walls and roof were also tested for Regulation 309 Leachate Quality Criteria. Composite samples were collected from stained areas of known chemical usage. Regulation 309 testing indicated that the plating room floor and walls, and some stockpiled foundry sands were classified as hazardous wastes. The roof and foundry floor and walls did not exceed the Regulation 309 Leachate Quality Criteria by a factor of 10 or more. In addition, the concrete in the bottom of the plant degreasing pit was broken up and samples of the subfloor sands were tested for solvent concentrations. Only trace levels were found.

A subconsultant was retained to inspect the building for the presence of asbestos. About ten samples were collected and tested. Asbestos insulation was found on pipes in the boiler room and also as a fire retardant on beams in the foundry. Contract specifications were drawn up for asbestos removal prior to building demolition. A qualified contractor was retained and the asbestos was removed. A final report documenting the asbestos removal was prepared for the Ministry of Labour in accordance with Regulation 654/85 of the Occupational Health and Safety Act.

Various miscellaneous chemicals which had been left in the plant were inventoried, labeled, sampled and registered with the MOE prior to their removal from the site by a licenced waste disposal firm. A wide variety of chemicals including paints, solvents, plating solutions, oil and other chemicals had to be identified and dealt with in an appropriate manner.

There was also a concern about the possible presence of PCB's in electrical equipment. An inventory of the electrical equipment in the building was carried out by an electrical contractor. The six oil-filled transformers present on site were sampled and tested. One of them slightly exceeded the 50 ppm limit for classification as a "PCB waste". MOE Director's Approval was required for draining this transformer, transportation of "PCB wastes" and the establishment of an approved hazardous waste storage facility at

the new manufacturing plant. Two small capacitors and fluorescent light ballasts which were also suspected of containing PCB's were also moved to the new plant for storage.

The environmental concerns identified during completion of the above tasks were documented in a report. Appropriate strategies for remediation were also presented. The report was submitted for review by the property owner, the redeveloper, the redevelopment architect, legal advisers, and the MOE staff.

The environmental investigation results were discussed and a number of remedial alternatives were considered and costed. A preferred remedial option was selected and a decommissioning plan report was prepared which outlined the details of the required decommissioning activities. The decommissioning plan report was then submitted for MOE review and comment prior to proceeding.

The main findings of the environmental investigations and the proposed remedial actions of the decommissioning plan are described below:

a) Almost all of the on-site soils exceeded one or other of the residential/parkland Soil Cleanup Guidelines. Only several smaller areas exceeded the Soil Cleanup Guidelines for cadmium, lead and mercury. These are the only three of the Cleanup Guidelines which are based on human health considerations. Guidelines for the other parameters are based on phytotoxicology or agricultural considerations.

   The decommissioning plan specified excavation and off-site disposal at an approved landfill for the soils which exceeded the lead, cadmium and mercury Cleanup Guidelines. Hard surfacing was proposed for the remaining areas in which the soils exceeded the guidelines for parameters like copper and zinc, which are not toxic to humans. It was decided to cover the entire property with a commercial shopping mall, roadways, parking lots or hard surfaced walkways. Residential components of the redevelopment plan were restricted to second storey or higher condominiums. All plantings were to be in raised gardens or pots.

b) The plating room floor and walls plus the foundry sands were found to be hazardous wastes under Regulation 309. They were excavated and disposed of at an approved hazardous waste facility. Two additional areas of stained subfloor soils which were identified and tested during the demolition and were also excavated and disposed of at an approved hazardous waste facility.

c) The asbestos and miscellaneous chemicals were removed from this site prior to demolition and were disposed of in an approved manner as described above. All electrical equipment containing PCBs were transferred to an approved storage facility at the new plant location.

One of the most difficult aspects of implementing the decommissioning plan was co-ordination of the demolition, trucking and waste disposal contractors. Excavation and loading of contaminated soils and building materials was supervised and follow-up sampling and inspections were carried out. Additional removal of contaminated material was required in a few locations based on the results of the follow-up sampling.

The site was inspected in conjunction with MOE staff following completion of the above tasks and demolition of all the buildings. Additional soil sampling and testing was carried out in a few locations at MOE's request. These laboratory test results did not indicate any contamination. A final report documenting the decommissioning was prepared for MOE review, in support of the application for a land use zoning change from industrial to commercial and high rise residential.

In summary, the decommissioning was a complex, multi-task project involving people from many different disciplines and professions. Maintaining communication between the various groups was probably the most important and most challenging aspect of the project.